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EXAMINER

CHOI, WILLIAM C

ART UNIT

PAPER NUMBER

2873

DATE MAILED: 09/30/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/073,958

Applicant(s)

KITAKA ET AL.

Examiner

William C. Choi

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 07 July 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-23 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-4 and 6-23 is/are rejected.
- 7) ☒ Claim(s) 5 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 10 April 2002 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_.
- 4) ☐ Interview Summary (PTO-413) Paper No(s) \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

## DETAILED ACTION

### *Claim Rejections - 35 USC § 102*

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1, 2 and 17 are rejected under 35 U.S.C. 102(b) as being anticipated by Sasaki et al (U.S. 5,986,788).

In regards to claims 1 and 2, Sasaki et al discloses an optical coupling system (abstract and column 1, lines 8-11, Figure 1) comprising: a first lens having an incident surface disposed in a certain direction and having a positive refractive power (column 5, lines 45-47, Figure 1, "10"), by said first lens, Gaussian beam-like luminous flux incident on said incident surface from a light source (column 5, lines 35-41, Figure 1, "s") being converted into approximately parallel luminous flux (column 1, lines 21-46, Figure 11(C)); and a second lens having the same refractive power as that of said first lens (column 5, lines 45-47, Figure 1, "12"), inherently having an incident surface and exit surface disposed in a reverse direction, this being reasonably assumed from the diverging and converging effects of the two lenses (Figure 11(C), "m1" and "m2"), respectively. Sasaki et al further discloses whereby in said second lens, said approximately parallel luminous flux incident on said incident surface of said second lens is converted into converged luminous flux (column 5, lines 38-39, Figure 11(C), re

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light exiting "m2"), said converged luminous flux being incident on a light-receiving unit (column 5, lines 47-50, Figure 1, "d"); wherein a distance  $2L$  between the two lenses is selected to be in a range given by an expression:  $1.8L_{\max} \leq 2L \leq 2L_{\max}$  in which  $2L_{\max}$  is a maximum distance (column 6, lines 31-34, Figure 1, "L2" and "L3"), which would inherently allow beam waists to be formed at equal distance from the two lenses respectively, this being reasonably assumed from Sasaki et al disclosing  $L_{\max}$  ( $L_2 + L_3$ ) being determined by  $\omega_2$  and  $\omega_4$ , respectively (column 6, lines 25-26, equation (1)) and equation (3) (column 7, line 3) and wherein variables  $\omega_2$  and  $\omega_4$  can be chosen from an infinite number of sets satisfying  $L_{\max}$ , which inherently would include  $\omega_2$  and  $\omega_4$  being equal (column 7, lines 62-67).

Regarding claim 17, Sasaki et al discloses wherein said first and second lenses are physically the same (Figure 1, "10" and "12").

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 8-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sasaki et al as applied to claim 1 above, and further in view of Dempewolf et al (U.S. 5,815,318).

Regarding claims 8-11, Sasaki et al discloses as set forth above but does not specifically disclose wherein said lens having a positive refractive power is a rod lens having a gradient index distribution in a direction of a radius thereof, a plano-convex lens having a gradient index distribution in a direction of an optical axis thereof, a plano-convex lens made of homogenous material or a sphere lens made of a homogenous material. Within the same field of endeavor, Dempewolf et al teaches that it is well known in the art to have optical fibers coupled with these types of lenses (column 1, lines 16-20 and column 3, lines 38-44).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made for said lens of Sasaki et al having a positive refractive power to be a rod lens having a gradient index distribution in a direction of a radius or an optical axis thereof since Dempewolf et al teaches that it is well known in the art to have optical fibers coupled with these types of lenses.

Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sasaki et al as applied to claim 1 above, and further in view of Hamanaka et al (U.S. 2001/0024548 A1).

Regarding claim 12, Sasaki et al discloses as set forth above but does not specifically disclose wherein the lens has a grating lens surface. Within the same field of endeavor, Hamanaka et al teaches that it is well known in the art to have optical

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fibers coupled by lenses having a grating lens surface (i.e. Fresnel lens) (page 2, section [0020]).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made, for the lens of Sasaki et al to have a grating lens surface since Hamanaka et al teaches that it is well known in the art to have optical fibers coupled by lenses having a grating lens surface.

Claims 6, 13 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sasaki et al as applied to claim 1 above, and further in view of Huang et al (U.S. 2003/0108312 A1).

Regarding claim 6, Sasaki et al discloses as set forth above, but does not specifically disclose wherein the light source and the light-receiving unit are constituted by end surfaces of optical fibers which are equal in mode field diameter. Within the same field of endeavor, Huang et al teaches that it is well known in the art of optical fiber coupling, for optical output components to include lasers or fibers (page 2, section 0022)) and further teaches wherein the optical fibers are equal in mode field diameter (pages 2 and 3, section [0024], Figure 4).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made for the light source and the light-receiving unit of Sasaki et al to be constituted by end surfaces of optical fibers, which are equal in mode field diameter since Huang et al teaches that it is well known in the art of optical fiber coupling, for optical output components to include lasers or fibers, which are equal in mode field diameter.

Regarding claim 13, Sasaki et al discloses as set forth above, but does not specifically disclose wherein an optical functional device is disposed at a midpoint between the two lenses in the optical coupling system. Within the same field of endeavor, Huang et al further teaches wherein it is desirable to have an optical functional device disposed at a midpoint between the two lenses of an optical coupling system for the purpose of providing additional processing to the light beam (page 2, section [0023]).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made for the optical coupling system of Sasaki et al to have an optical functional device disposed at a midpoint between the two lenses of an optical coupling system since Huang et al teaches that it is desirable to have such a device for the purpose of providing additional processing to the light beam.

Regarding claim 14, Sasaki et al further discloses wherein said optical coupling system is provided as an optical coupling system array in which optical coupling systems having the same function are arranged in a plurality of rows (Figure 11(C)).

Claims 3, 4, 7, 15, 16 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mooradian (U.S. 5,327,447).

In regards to claims 3 and 4, Mooradian discloses an optical coupling system (Figure 1a) comprising: a lens having a positive refractive power (column 3, line 19, Figure 1a, "14"), by said lens, Gaussian beam-like luminous flux incident on said incident surface from a light source being converted into approximately parallel luminous flux (Figure 1a, re light beam); and a reflection surface disposed at the rear of

said lens so that said approximately parallel luminous flux is reflected by said reflection surface to return to said lens (column 3, line 19, Figure 1a, "16"), said returning luminous flux being converted by said lens into converged luminous flux which is incident on a light-receiving unit disposed in said light source and its vicinity (column 3, lines 22-25, Figure 1a, "16"); but does not specifically disclose wherein a distance L between said lens and said reflection surface is selected to be in a range given by the claimed expressions.

It has been held that in the recitation that it is not inventive to discover optimum conditions or workable ranges by routine experimentation and that this experimentation is no more than the application of the expected skill of an engineer. In re *Aller et al.* 105 USPQ 233. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made for the distance L between said lens and said reflection surface is selected to be in a range given by the claimed expressions, since in re *Aller et al* recites that it is not inventive to discover optimum conditions or workable ranges by routine experimentation and that this experimentation is no more than the application of the expected skill of an engineer.

Regarding claims 7 and 18, Mooradian discloses wherein said light source also serves as said light-receiving unit (column 3, lines 22-25, Figure 1a, "12") but does not specifically disclose an end surface of an optical fiber serving as said light source. Examiner takes official notice that it is well known in the art for laser light to be provided through an optical fiber. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made for an end surface of and optical fiber to



serve as a light source since it is well known in the art for laser light to be provided through an optical fiber, which inherently would have the light source and receiving unit having the same mode field diameter, since they are one and the same.

Regarding claim 15, Mooradian discloses an optical functional device disposed at a midpoint between the lens and the reflection surface in said optical coupling system (column 5, lines 1-4, Figure 1(e), "17").

Regarding claim 16, Mooradian discloses wherein said lens is provided as a lens array in which lenses having the same function are arranged in a row (column 6, lines 11-21, Figure 5(a), "516" and "518").

Claims 19-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mooradian as applied to claim 3 above, and further in view of Dempewolf et al (U.S. 5,815,318).

Regarding claims 19-22, Mooradian discloses as set forth above but does not specifically disclose wherein said lens having a positive refractive power is a rod lens having a gradient index distribution in a direction of a radius thereof, a plano-convex lens having a gradient index distribution in a direction of an optical axis thereof, a plano-convex lens made of homogenous material or a sphere lens made of a homogenous material. Within the same field of endeavor, Dempewolf et al teaches that it is well known in the art to have optical fibers coupled with these types of lenses (column 1, lines 16-20 and column 3, lines 38-44).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made for said lens of Mooradian having a positive refractive

power to be a rod lens having a gradient index distribution in a direction of a radius or an optical axis thereof since Dempewolf et al teaches that it is well known in the art to have optical fibers coupled with these types of lenses.

Claim 23 is rejected under 35 U.S.C. 103(a) as being unpatentable over Mooradian as applied to claim 3 above, and further in view of Hamanaka et al (U.S. 2001/0024548 A1).

Regarding claim 23, Mooradian discloses as set forth above but does not specifically disclose wherein the lens has a grating lens surface. Within the same field of endeavor, Hamanaka et al teaches that it is well known in the art to have optical fibers coupled by lenses having a grating lens surface (i.e. Fresnel lens) (page 2, section [0020]).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made, for the lens of Mooradian to have a grating lens surface since Hamanaka et al teaches that it is well known in the art to have optical fibers coupled by lenses having a grating lens surface.

### ***Allowable Subject Matter***

Claims 5 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter: The prior art fails to teach a combination of all the claimed features as presented

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in claim 5: an optical coupling system as claimed specifically wherein said total coupling loss is not larger than 0.05 dB.

### ***Response to Arguments***

Applicant's arguments with respect to claims 1, 2, 5, 6, 8-14 and 17 have been considered but are moot in view of the new ground(s) of rejection.

Applicant's arguments with respect to claims 3, 4, 7, 15 and 16 have been fully considered but they are not persuasive. In the remarks, applicant argues that, in order for a beam waist to be formed at the reflection surface, the distance between the laser and the lens and the lens and the reflection surface must be greater than one focal length. Examiner reiterates that such adjustments to the system of Mooradian are within the scope of optimizing conditions of the system, which are well within the ability of one of ordinary skill in the art. Therefore, examiner maintains the initial rejection.

### ***Prior Art Citations***

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Lynch et al (U.S. 5,077,622) is being cited herein to show an optical coupling system having some of the structural limitations of that of the claimed invention.


**Conclusion**

Any inquiry concerning this communication or earlier communications from the examiner should be directed to William C. Choi whose telephone number is (703) 305-3100. The examiner can normally be reached on Monday-Friday from about 9:00 am to 6 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Georgia Y. Epps can be reached on (703) 308-4883. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 305-3431 for regular communications and (703) 305-3432 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

W.C.  
William Choi  
Patent Examiner  
Art Unit 2873  
September 9, 2003

  
Georgia Epps  
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